

Tachycardias after atrial incisions – mechanisms, prevention and ablation

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ABSTRACT

This work was carried out at the Departments of Cardiology and Cardiac Surgery, Skejby Hospital, University of Aarhus.

Tachycardias after atrial incisions are a frequent and serious problem. The majority of them are based on a reentrant electrical activation around a combination of anatomic and surgically created obstacles.

The aim of this work was to quantify the magnitude of the problem, characterize the tachycardias after different operations and to develop a prophylactic strategy, aimed to prevent the most frequent tachycardias. We used a combination of retrospective and prospective studies.

The methods used were analysis of surface electrocardiograms and intracardiac electrical signals including conventional and electroanatomic mapping, as well as cardiac stimulation.

The results emphasize the importance of right atrial incision in the pathogenesis of atrial tachycardia after heart surgery. Atrial tachycardia occurred in 17% of patients after the standard left atrial approach to mitral valve. However, the incidence was as high as 35% after the other frequently used approach, which includes also a right atrial incision. The presence of right atrial incision was an independent predictor of atrial tachycardia after mitral valve surgery.

Typical atrial flutter was the most common atrial tachycardia, irrespective of the surgical substrate, followed by incisional atrial tachycardia. During incisional atrial tachycardia, the reentrant activation circulates around the right atrial incision. Three quarters of all tachycardias were typical atrial flutter or incisional atrial tachycardia. Both of these tachycardias depend on the corridor between the right atrial incision and the tricuspid annulus. Postoperative scarring may lead to proarrhythmogenic slowing of conduction in this corridor. Blocking this corridor by intraoperative cryoablation was feasible and prevented the occurrence of atrial tachycardia. The cryoablation completely blocked the conduction through the corridor in 10 of 13 patients. None of the patients with complete block developed atrial tachycardia, while all 3 patients without block developed atrial tachycardia.

In conclusion, atrial tachycardia is very frequent after a right atrial incision. In the majority of cases, it depends on the corridor between the incision and the tricuspid annulus. A prophylactic strategy targeting this corridor seems justified in combination with a simple right atriotomy and mitral surgery that includes a right atrial incision. Due to its potential proarrhythmogenicity, a high success rate is necessary before such intervention can be used as a routine. Further, preferably randomized studies are needed to determine the role of changes in surgical technique to prevent tachycardias after atrial incisions.